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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/714,795	11/17/2003	Jian Li	5853-376	2973
30448	7590	03/09/2006	EXAMINER	
AKERMAN SENTERFITT P.O. BOX 3188 WEST PALM BEACH, FL 33402-3188			SULLIVAN, JULIANNE M	
			ART UNIT	PAPER NUMBER
			3737	

DATE MAILED: 03/09/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

### Period for Reply

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If no period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 17 November 2005.  
2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-4,6-14 and 16 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4,6-14 and 16 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 17 November 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## **DETAILED ACTION**

### ***Response to Arguments***

1. Applicants' arguments with respect to Claims 1-4, 6-14 and 16 have been considered but are moot in view of the new ground(s) of rejection.
2. Regarding Applicants' arguments with respect to the rejection of Claims 1 and 11 as anticipated by Sepponen (U.S. Patent No. 4,641,659) and by Wang (U.S. Patent No. 6,567,688), the Examiner has introduced different references, Kruger (U.S. Patent No. 6,104,942) and Van Veen et al. (U.S. Patent Application Publication No. 2003/0088180), to meet the limitations of the amended claims.
3. Applicants' arguments, see pages 11-13, filed November 17, 2005, with respect to the provisional double patenting rejection of Claims 1-3, 5, 11 and 15 have been fully considered and are persuasive. The provisional double patenting rejection of Claims 1-3 and 11 has been withdrawn (Claims 5 and 15 having been cancelled).

### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1-4, 8, 11-14 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kruger (U.S. Patent No. 6,104,942) in view of Van Veen et al. (U.S. Patent Application Publication No. 2003/0088180).

Kruger teaches a method of and apparatus for examining biological tissue including radiating a region of tissue with microwave radiation pulses that span a range of microwave frequencies, where the tissue region emits thermoacoustic signals responsive to the microwave pulses that are received by an acoustic transducer array that may be mechanically moved, which then provides electrical signals in response, and where the radiation pulses are produced by at least one antenna and include a plurality of polarizations, and forming at least one image of the tissue region from the thermoacoustic signals, where the at least one image comprises a plurality of images from fractional portions of the tissue that are combined to form an overall image (col. 1, lines 13-15, col. 3, lines 1-30, col. 4, lines 3-32, 42-51 and 63-67, col. 5, lines 1-45 and 60-67 and col. 6, lines 1-7). Kruger does not explicitly teach that the range of microwave frequencies is at least 600 MHz or at least 1 GHz, that the tissue region is breast tissue and that the at least one antenna is a horn antenna.

In the same field of endeavor of microwave imaging of tissue, Van Veen et al. teaches the use of ultrawideband microwave frequencies to image breast tissue, where the microwave radiation is produced by a horn antenna (paras. 3, 5, 29 and 43). Although Van Veen et al. uses the applied microwave radiation for traditional microwave imaging by receiving the microwave energy reflected by the tissue, the application of microwave energy would inherently cause the heating of tissue that produces the thermoacoustic signals as in Kruger. Thus, one of ordinary skill in the art would understand that the radiation applied by Van Veen et al. could be used for thermoacoustic imaging. Further, it would have been obvious to one of ordinary skill in the art at the time of the invention that applying a wider range of frequencies results in more information collected, and thus improved images of the tissue. As Kruger teaches the application

of microwave energy swept across a range of frequencies, it would have been obvious to use the ultrawideband frequencies of Van Veen et al. in order to maximize the detail in the information collected.

6. Claims 6, 7, 9 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kruger in view of Van Veen et al. as applied to Claim 1 above, and further in view of Bolstad et al. (U.S. Patent No. 5,630,154).

Kruger in view of Van Veen et al. teaches all of the features of the present invention, including the use of a beamforming technique (Van Veen et al. at paras. 6, 8, 10, 29 and 34), except for expressly disclosing that the beamforming technique used to form the images is an adaptive beamforming technique, including providing a sensor array with a plurality of sensor elements, where an array steering vector corresponding to a signal of interest is unknown, representing the array steering vector with an ellipsoidal uncertainty set, bounding a covariance fitting relation for the array steering vector with the uncertainty ellipsoid, and solving the fitting relation to provide an estimate of the array steering vector, and that pattern recognition is performed on the image using adaptive signal processing. In a related field of endeavor, Bolstad et al. teaches computational methods of adaptive beamforming and adaptive signal processing (col. 1, lines 24-38, col. 3, lines 15-42, col. 4, lines 49-67, col. 5, lines 1-4 and col. 6, lines 13-48). It would have been obvious to one of ordinary skill in the art at the time of the invention to have used the methods of Bolstad et al. with those of Kruger to reduce the complexity of the calculations required to produce and analyze the images, in order to increase the speed of the processing and reduce the cost of the system (see for motivation Bolstad et al. at col. 1, lines 24-38).

*Conclusion*

7. Applicants' amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Julianne M. Sullivan whose telephone number is 571-272-6084. The examiner can normally be reached on Monday through Friday 8:00am to 4:30pm.

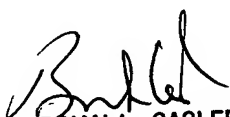
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian Casler can be reached on 571-272-4956. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 3737

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



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